

Gas Recovery Solutions

“Aurora Eco-System” Technology

**To Prevent Methane Emissions from
Pneumatic Well Site Equipment**

&

To Monetize Recovered Natural Gas

www.gasrecoveryolutions.com

Market Need: What Oil & Gas Industry Challenges Do We Solve?

- » Today, raw produced gas (un-combusted) is often used **to drive pneumatic equipment at well sites**, such as glycol pumps, controllers, valves, switches and plunger lifts—a.k.a. **“instrument air”**
 - Especially in cold climates—**Marcellus/Utica; Rockies; Williston; Midcontinent and Canadian basins**
 - **Any well site using these devices will vent or flare the same amount of gas**—regardless of the amount produced
- » **This is now under threat from new, stricter government regulations to reduce “fugitive” methane emissions—BLM, EPA, States and Canadian regulators**
 - Use of produced gas as “instrument air” means that **methane must be vented or flared**
 - **Many producers are not aware of this methane emissions source**
 - Potentially significant fines or other regulatory consequences
- » That produced gas cannot be sold to market ➡ **Lost Revenues**
 - ~ 50 MCF/day per well for instrument air = ~ **\$35,000/year of lost revenue per well @ \$2/MCF**
 - ~ **\$350,000/year for a 10-well pad**—regardless of the amount of gas produced
 - Producers often greatly underestimate (by up to **10 X**) the amount of gas used to drive their pneumatic devices
- » **VOCs** are also often produced when using gas as instrument air—formaldehyde from glycol + flaring
- » Untreated, “wet” gas corrodes equipment and freezes lines ➡ **Equipment failure + repair costs**
 - Can also **cause valves and seals to degrade** ➡ **Exacerbates methane emissions**

Our Solution: “Aurora Eco-System” for Instrument Air at Well Sites

- » Aurora Eco-Systems provide **clean, dry compressed air** *instead of using gas to drive pneumatic devices*
 - Reduces or eliminates methane emissions at oil & gas wells (wet or dry gas)—*avoids venting & flaring*
 - Producers to **sell & monetize gas** that would otherwise be consumed as instrument air—*“found revenues”*
 - **Avoids potential fines and other regulatory consequences**
- » Requires **no changes** to current well site operating procedures
- » **Commercially proven—60+ units deployed** for large E&P cos.
 - USA, Canada & South America
 - In some of the world’s hottest & coldest climates
- » **Scalable, mobile and re-deployable**
- » **Installation, training + O&M services provided (optional)**
- » Large Aurora units can serve **3-15 wells per unit** (multi-well pads)
- » Small Aurora units can serve 1 well each
- » **Payback periods 1-2 years**—from recovered gas sold to market
 - *Not including* avoided fines of up to \$500/day per well (BLM))



Aurora Eco-System Description—Patents Pending

- » *Does not require any changes to current well site operating procedures*
- » **Compression system** powered by an emissions-free **solar and/or wind power generation** system plus a **battery pack** for power storage—**entirely off the grid**
 - 24/7 operation
- » **Remotely monitored via satellite/cellular networks**
- » Entire system is **contained in one shipping container**—installed in one day
 - No special hook-ups/infrastructure required
 - Uses existing piping & tubing
- » **Mobile & scalable**
- » **No power grid connection** required
- » **No permits required**
- » **Quad-0 compliant (EPA)**
- » **Comprehensive warranty**



Summary: Aurora Eco-System Benefits

Economic

- » **Improve net gas production and increase revenues** by avoiding onsite consumption of gas
- » **Reduce CAPEX** by **avoiding premature equipment failure** from exposure to corrosive “wet” gas
- » **Reduce OPEX (labor costs & downtime)** associated w/ **checking for leaks; repairs; replacements**

Environmental

- » **Reduce methane emissions** by reducing or eliminating methane **venting, flaring and leaking**
- » **Reduce VOC production & emissions** from well site equipment
- » **Reduce NOx emissions** by reducing or eliminating flaring

Operations & Reliability

- » **Improve reliability of equipment.** Avoid premature failure from exposure to corrosive wet gas.
- » **Avoid freezing of equipment & lines** from the use of wet gas (prone to freezing)
- » **Prevent additional methane emissions from corroded valves & seals**

Safety

- » Eliminating use of flammable natural gas as instrument air **improves well site safety overall**

GRS's Financing & Revenue Sharing Program—"No Money Down"

Producers: You can purchase Aurora units from us OR partner with us

Background & Purpose

- » Capital budgets are currently constrained for many E&P companies
- » But the need to comply with new methane regulations + capture lost revenues is urgent
- » GRS has developed a **"no money down" financing & revenue sharing program** to allow Aurora units to be deployed for E&P cos. **without requiring a purchase or CAPEX**

Program Overview

- » GRS and its capital partners provide **100% of financing** to deploy Aurora units
- » **GRS and the well owner/operator share revenues** from the sale of natural gas that would otherwise be consumed onsite as instrument air
- » Instrument air usage is measured in accordance with **AGA standards & practices**
- » Operating charges & accounting protocols in accordance with **Oil & Gas industry norms**

Sample Test Results: Aurora Eco-Systems at Green River Basin (WY) Gas Wells

Well Information			Standard										
Elevation:	6,770	feet	NG Flow			Methane			Ethane, Propane, & Butane			CO ₂	
Temperature:	32	°F	(scfm)	(scfd)	(\$/day)	85%	90%	95%	0%	5%	10%	Flared	
Number of Wells:	3					(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	
Gage Pressure:	100	psi											
Actual Gas Flow:	14.8	cfm											
Natural Gas Weight:	0.0438	pcf (at 60 °F)											
CO ₂ (Flared NG):	128.4	lbs/Mcf											
NG Cost:	\$2.93	per MMBtu											
Natural Gas Cost:	\$3.00	per Mcf											
Act.Atm. Pressure:	11.44	psi											
Std. Atm. Pressure:	14.696	psi (at 60 °F)											
			Total	118.7	170,920	\$513.32	6363	6,738	7,112	0	374	749	21,946
			Per Well	39.6	56,973	\$171.11	2,121	2,246	2,371	0	125	250	7,315

Note 1: This model is for demonstration purposes only.

Note 2: All emissions data and calculations were obtained from the EPA/EIA website.

Note 3: Methane gas composition may vary dramatically (data used in model calculations were "typical composition").

Note 4: Our companies accept no liability for the content of this model, or the consequences of any action taken on the basis of the information provided.

Well Information			Standard										
Elevation:	7,000	feet	NG Flow			Methane			Ethane, Propane, & Butane			CO ₂	
Temperature:	55	°F	(scfm)	(scfd)	(\$/day)	85%	90%	95%	0%	5%	10%	Flared	
Number of Wells:	3					(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	(lbs/day)	
Gage Pressure:	100	psi											
Actual Gas Flow:	9.861	cfm											
Natural Gas Weight:	0.0438	pcf (at 60 °F)											
CO ₂ (Flared NG):	128.4	lbs/Mcf											
NG Cost:	\$2.62	per MMBtu											
Natural Gas Cost:	\$2.69	per Mcf											
Act.Atm. Pressure:	11.34	psi											
Std. Atm. Pressure:	14.696	psi (at 60 °F)											
			Total	75.5	108,695	\$291.90	4047	4,285	4,523	0	238	476	13,956
			Per Well	25.2	36,232	\$97.30	1,349	1,428	1,508	0	79	159	4,652

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Gas well owners routinely underestimate the amount of gas consumed as instrument air.
35-60 Mcfd is typical ➡ Often 10% or more of a well's produced gas.

Reduce methane emissions while increasing gas revenues!

Contact Information

To purchase Aurora Eco-Systems for your well sites or to discuss GRS's 100% financing & revenue sharing program, please contact us at:

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